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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/087,825	03/05/2002	Kaspar Tobias Winther		5178

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EXAMINER
SARKAR, ASOK K

ART UNIT	PAPER NUMBER
2829	

DATE MAILED: 08/13/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application N .	Applicant(s)	
	10/087,825	WINTHER, KASPAR TOBIAS	
	Examin r	Art Unit	
	Asok K. Sarkar	2829	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Peri d for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *05 March 2002* .

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-20* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-20* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *31 May 2002* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

11)☐ The proposed drawing correction filed on _____ is: a)☐ approved b)☐ disapproved by the Examiner.

If approved, corrected drawings are required in reply to this Office action.

12)☐ The oath or declaration is objected to by the Examiner.

Pri rity under 35 U.S.C. §§ 119 and 120

13)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____ .

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

14)☒ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).

a) ☐ The translation of the foreign language provisional application has been received.

15)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO-1449) Paper No(s) *4* .
4) ☐ Interview Summary (PTO-413) Paper No(s). _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: .

DETAILED ACTION

Claim Rejections - 35 USC § 10

1. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

2. Claims 1, 3 – 6, 9, 12 – 14, 16 and 17 are rejected under 35 U.S.C. 102(b) as being anticipated by Zimmer, US 3,284,174.

Regarding claim 1, Zimmer teaches a method to join materials comprising the steps of :

- (a) providing an intermediate layer (connecting parts) with a gradual change in thermal expansion coefficients across the layer in column 1, lines 15 – 25 and also in column 10, lines 10 – 15 and
- (b) means of bonding the materials to each side of the intermediate layer whereby the materials can be joined in a manner that withstand changes in temperature despite the materials having different thermal expansion coefficients in column 1, lines 10 – 13 and in between lines 43 – 60.

Regarding claims 3 – 6, 13 and 14, Zimmer teaches forming the intermediate layers with various distinct metallic alloy systems/layers (claim 3) and changing their chemical compositions (claim 5) in order to gradually change and match the thermal expansion coefficient from one material to the other with reference to Figs 1 – 3 and associated explanations in column 4, line 74 to column 5, line 22. Zimmer also provides

the composition of various alloy systems in column 1, lines 30 – 43 and methods of making these alloys through conventional/ powder metallurgy processes throughout the disclosure.

The attainment of joining (claims 3, 4, 6 and 14) and the gradual changes in the thermal expansion in the intermediate layer (claim 13) in Zimmer's process is inherently achieved through the diffusion process since the final equilibrium in any metallurgical process of alloying and joining is achieved through diffusion of ions in order to allow interatomic attraction forces to become effective by bringing the atoms closer together (see column 1, lines 43 – 47).

Regarding claim 9, Zimmer teaches intermediate layer selected from metal alloys in column 1, lines 24 – 43.

Regarding claim 12, Zimmer teaches fusion bonding in column 1, lines 50 – 60.

Regarding claim 16, most of the limitations of the claim have been described earlier in rejecting claim 1. The utilization of the intermediate layer as a spacer is shown with respect to Fig. 2.

Regarding claim 17, Zimmer teaches a sheet (i. e. "connecting part") with reference to Fig. 2 in which layer with gradual change in thermal expansion is shown with reference to Fig. 1.

3. Claim 15 is rejected under 35 U.S.C. 102(b) as being anticipated by Slattery, US 5,988,488.

Slattery teaches a method to join materials by (a) sandwiching a plurality of

layers 24 between materials 22 and 20 with reference to Figs. 2 and 3 and heating the materials and the layers (during the plasma spray process and hot pressing described in column 5, lines 35 – 55 and in column 6, lines 25 - 35) such that gradual compositional changes are generated across the plurality of layers as they form the FMG (see column 5, lines 35 - 55) whereby the materials 22 and 20 can be joined in a manner that withstand changes in temperature despite the materials having different thermal expansion coefficients (see the summary of the invention in columns 1 and 2).

Claim Rejections - 35 USC § 103

4. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

5. Claims 2, 7 and 18 are rejected under 35 U.S.C. 103(a) as being unpatentable over Zimmer, US 3,284,174 in view of Maruyama, US 5,580,658.

Regarding claim 2, Zimmer teaches forming the intermediate layers with various metallic alloy systems and changing their compositions in order to gradually change continuously and match the thermal expansion coefficient from one material to the other with reference to Figs 1 – 3 and associated explanations in column 4, line 74 to column 5, line 22.

Zimmer fails to teach variation in chemical composition in a direction perpendicular to the bonding surface.

Maruyama teaches a functionally gradient material in which variation of composition is continuous (column 2, lines 41 – 42) and the composition varies in the thickness direction (perpendicular to the bonding surface) of the composite material having a plate-like shape (column 2, lines 53 – 55) so that a practical composite material having two dissimilar materials at both ends is produced (column 3, lines 43 – 58). Functionally gradient materials will inherently have a gradual change of the thermal expansion coefficient.

Therefore, it would have been obvious to one with ordinary skill in the art at the time of the invention to modify Zimmer's teachings in light of the above mentioned figures and vary the chemical composition in a direction perpendicular to the bonding surface so that the connecting part has a uniform compositional change and therefore gradual thermal expansion change in order to form thermally stable plate-like joined parts as taught by Maruyama.

Regarding claims 7 and 18, Zimmer teaches forming the intermediate layers with various metallic alloy systems and changing their compositions in order to gradually change and match the thermal expansion coefficient from one material to the other with reference to Figs 1 – 3 and associated explanations in column 4, line 74 to column 5, line 22.

Zimmer fails to teach the intermediate layer possessing variation in the relative proportions of different phases in a direction perpendicular to the bonding surface.

Maruyama teaches a functionally gradient material of two different phases in which variation of composition is continuous (column 2, lines 41 – 42) and the

composition varies in the thickness direction (perpendicular to the bonding surface) of the composite material having a plate-like shape (column 2, lines 53 – 55) so that a practical composite material having two dissimilar materials at both ends is produced (column 3, lines 43 – 58). Functionally gradient materials will inherently have a gradual change of the thermal expansion coefficient.

Therefore, it would have been obvious to one with ordinary skill in the art at the time of the invention to modify Zimmer's teachings in light of the above mentioned figures and vary the chemical composition so that the intermediate layer possess a variation of different phases in a direction perpendicular to the bonding surfaces as taught by Maruyama and therefore gradual thermal expansion change in order to form thermally stable joined parts.

Claims 10 and 11 are rejected under 35 U.S.C. 103(a) as being unpatentable over Zimmer, US 3,284,174 in view of Oliver, US 6,114,188.

Zimmer teaches various bonding/joining techniques in column 1, lines 43 – 67 and brazing in column 6, line 36. Zimmer fails to teach bonding by anodic bonding and adhesive bonding by introducing layer of adhesives between the intermediate layer and either of the two materials.

Oliver teaches bonding techniques for two materials by the use of anodic bonding and adhesives for materials having different thermal expansion coefficients in column 3, lines 29 – 40.

Therefore, it would have been obvious to one with ordinary skill in the art at the time of the invention to modify Zimmer's teachings and use bonding techniques such as

anodic bonding and introduction of adhesive layers since Oliver teaches that these bonding techniques can be used to bond two dissimilar materials having different thermal expansion coefficients.

6. Claims 8 and 19 are rejected under 35 U.S.C. 103(a) as being unpatentable over Zimmer, US 3,284,174 in view of Maruyama, US 5,580,658 as applied to claim 7 above, and further in view of Dumesnil, US 4,997,718.

Zimmer in view of Maruyama fails to teach that the variation in the relative proportions of different phases is accomplished by using a layer of resin with gradual change in the filler from one side of the intermediate layer to the other side of the intermediate layer.

Dumesnil teaches a technique for bonding two materials with different thermal expansion coefficients such as ceramic and semiconductor (see column 1, lines 15 – 18) in which he uses a low temperature glass that can be formed by using a resin and glass powder (column 2, lines 36 – 39) and filler (column 2, lines 60 – 63). The compositional change will inherently vary the thermal expansion coefficient of the intermediate layer.

Therefore, it would have been obvious to one with ordinary skill in the art at the time of the invention to modify Zimmer's teachings with that of Dumensil so that the bonding can be achieved at low temperature (see column 1, lines 15 – 19).

7. Claim 20 is rejected under 35 U.S.C. 103(a) as being unpatentable over Zimmer, US 3,284,174 as applied to claim 16 above, and further in view of Dumesnil, US 4,997,718 and Kodas, US 6, 360,562.

Zimmer fails to teach the layer is formed from a sol-gel precursor.

Dumesnil teaches that bonding can be achieved by using glass as was explained above in rejecting claims 8 and 19.

Kodas teaches that glass composition can be made homogeneous by the use of sol-gel process in column 30, lines 21 - 30.

Therefore, it would have been obvious to one with ordinary skill in the art at the time of the invention to modify Zimmer's teachings with that of Dumensil so that the bonding can be achieved at low temperature and use the glass composition that is made by the sol-gel process taught by Kodas since the glass will have a homogeneous composition for better compositional control (see column 30, lines 21 – 30).

Conclusion

8. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Asok K. Sarkar whose telephone number is 703 308 2521. The examiner can normally be reached on Monday - Friday (8 AM- 5 PM).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Kammie Cuneo can be reached on 703 308 1233. The fax phone numbers for the organization where this application or proceeding is assigned are 703 308 7722 for regular communications and 703 308 7722 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is 703 308 4918.

Asok Kumar Sarkar

Asok K. Sarkar
August 8, 2003